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An experimental study of grain sorting effect on braided pattern

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Braided rivers are characterized by complex morphologies comprising several channels, and their dynamic is still poorly understood. A better understanding of the braiding response to different river equilibrium states (equilibrium, erosion or aggradation) is essential for a sustainable river management. We conducted a series of laboratory experiments to study the effects of sediment supply conditions (particle size distribution and feeding rates) on braided river morphology.
Two series of experiments were carried out, the first with uniform sediments (0.5 to 1.5 mm with an average diameter of 0.7 mm), and the second with a bimodal distribution consisting of a mixture of coarse and fine sands, ranging between 1.5 mm to 3 mm with a mean diameter of 1.8 mm. Both sands had different colours in order to facilitate visual observations of grain sorting and to measure the spatial distribution of different grain sizes. Hydro-sedimentary conditions were maintained constant in both cases throughout the experiment. Successive bed topographies were measured using the Moiré method. Both sets of experiments showed different mechanisms.
The experiments with uniform sediments suggest that bars morphology is controlled by the continuous propagation of sedimentary lobes. The lobe deposit creates various morphological units including "sedimentary" border and large scour areas. The experiment with non-uniform sediments showed the importance of segregation in the braiding process, with coarse deposits controlling the bed roughness, and as a consequence, the direction of the main flow and paths taken by the coarse and fine grains. Selective depositions produce heterogeneous bed surface grain sizes.
The geometry of the confluence of two active channels also depends on the grain size range. Indeed, the depth of the confluence area seems smaller with heterogeneous sediment: coarse sediments are attracted in the pool, limiting thereby erosion. These observations give us keys for understanding the morphology and dynamics of braiding patterns in the field.